



University of Prince Mugrin
College of Engineering



AE 475 – Surveying for Architectural Engineering

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Overview

- ◆ Course description
- ◆ Course outlines
- ◆ Instruments used in this course
- ◆ Lab experiments
- ◆ Course outcomes
- ◆ Assessments
- ◆ Textbook and References
- ◆ Importance of surveying

Course description

- ◆ This course focuses on the various types and techniques of Surveying and their applications in architectural engineering.
- ◆ It will cover the practice of the distance measurements, leveling, horizontal and vertical angle measurements, satellite positioning system, preparation of site map, earthwork computation, construction and route surveying
- ◆ This course also covers the background of GPS system, geographic information system as well as their various applications in engineering project.

Course outlines



Week	Topic
1	Fundamental concepts and applications of surveying
2	Linear distance measurements
3	Leveling
4	Leveling
5	Profile and cross-section surveys
6	Angles and directions
7	Coordinates geometry
8	Traversing and coordinates computations
9	Traversing and coordinates computations
10	Area calculations
11	volume calculations
12	Topographic surveying and mapping
13	Topographic surveying and mapping
14	Introduction to GIS and GPS
15	Introduction to GIS and GPS

Course learning outcomes

Students who successfully complete this course should be able to :

- Use the different methods of distance measurements, differential leveling and its applications.
- Understand the angle measurements, traverse surveys, theodolites and its applications
- Calculate the area and the volume computations
- Describe and explain the Topographic surveying and mapping
- Communicate effectively using written and graphical skills to prepare technical reports, analyze and interpret data obtained from laboratory experiments

Evaluation

Course Assessment Tools	Percent %
Homework & Attendance	10%
Quizzes	10%
Lab	20%
Midterm	25%
Final Exam	35%

Textbook and References

Text Book:

Barry Kavanagh, Tom Mastin, (2014), **Surveying: Principles and Applications**, 9th Edition, Pearson

References:

- [1] Ghilani, C. D., & Wolf, P. (2015). **Elementary surveying**. 15th edition, Pearson.
- [2] Kavanagh, B. (2011). **Surveying with construction applications**. Pearson.
- [3] Nathanson, , Lanzafama, & Kissam, (2011). **Surveying fundamentals and practices**. Pearson.

Instruments might be used in this course



Ranging
rod



Automatic level



Digital theodolite



Handheld GPS



Total station



Tape



Compass



Wheel



EDM

Lab experiments

Week	Topic	Equipment
1		
2	Determining pace length	Steel tape. range poles, and chaining pins
3	Linear measurements by tape	Steel tape. range poles, plumb bob and chaining pins
4	Determining elevations	Level, and staff
5	Horizontal and vertical angles measurement	Digital theodolite, and range poles
6	Traversing and coordinates computations	Digital theodolite, range poles, tapes, and compass
7	Introductory to Total station.	Total station, and target(Prism)
8	Detail surveying	Total station, and target
9	Surface area calculations and field measurements	Total station, and target
10	Setting out measurements using Total station	Total station, and target
11	Setting out civil and architectural designs	Total station, and target
12	The use of global positioning system (GPS)	Handheld GPS receivers or data collectors
13	Distance measurements using EDM	EDM

What do we do in Surveying?

Measuring distances, angles, and positions, **on** or **near** the surface of the earth

Why?

- For engineering project
- For geographical mapping

Example 1 (why surveying is needed)

- Construction of a building

What is needed to construct a building?

- Site selection
- Knowledge of topography (Map)
- Planning building on it
(plan to meet the requirements)
- Transfer the building into the site

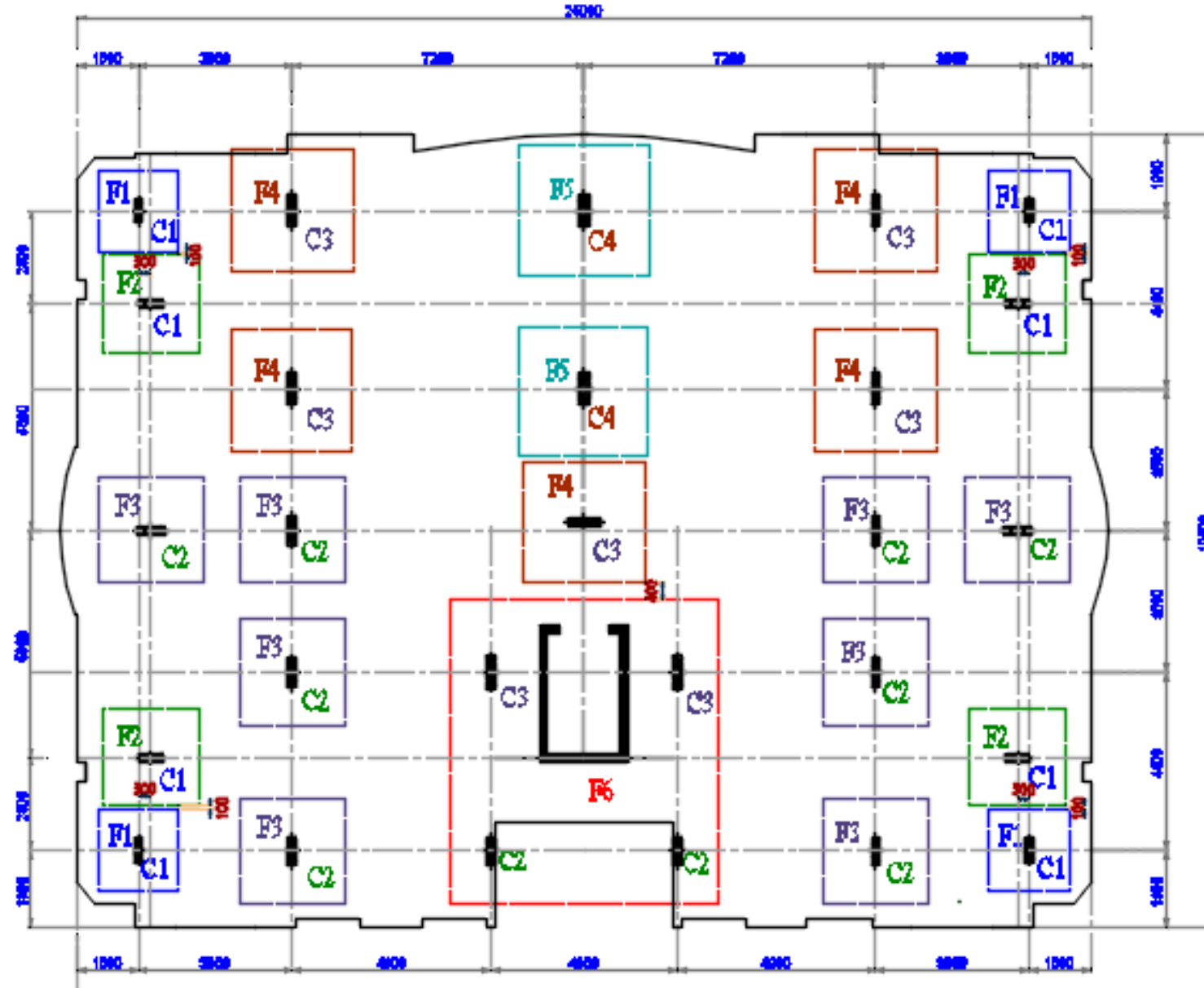
Where the surveying is needed to do this



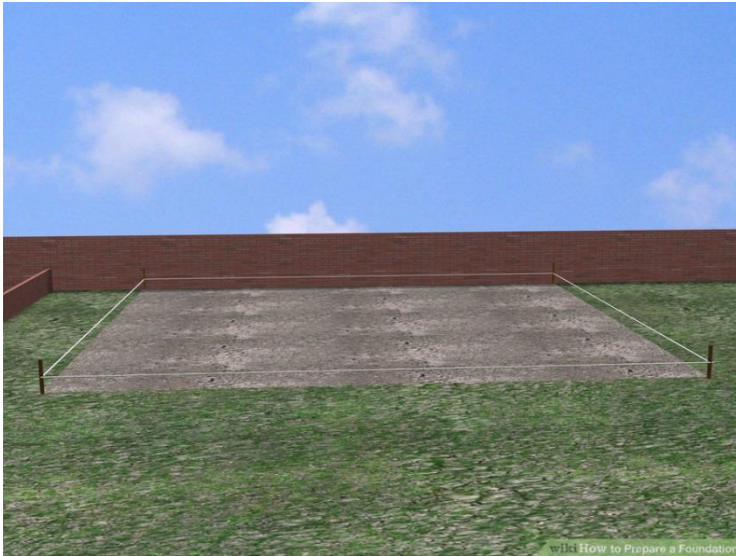
Surveying in construction

- ❑ They are the first people on any construction site, **measuring** and **mapping** the land.
- ❑ These primary measurements are then used by **architects** to understand and make the most of the unique landscape when designing
- ❑ **Civil engineers** make structural design accurately and safely, ensuring buildings not only fit with the landscape but are able to be constructed

Example for structural drawing Foundation and column layout



Surveying in construction



Mistakes due to incorrect surveying



Why Surveying?

- Surveying in construction in simple terms is to ensure that **everything is in the right place** on the right alignment where they are intended to be. Why?
- Because...
- ...we do not want conflict especially in **property lines**.
- ...we do not want **unplumbed columns**
- ...we don not want **misaligned structures**
- ...we want that **elevations** to be correct
- ...we want correct **estimates**

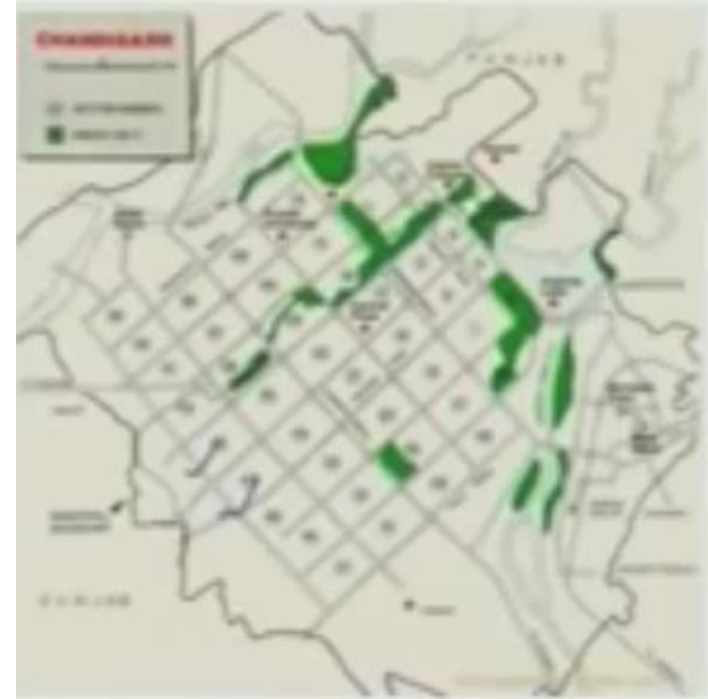
Example 2 Town planning

- Planning of a town

What is needed to Plan a town?

- Site selection
- Knowledge of topography (Map)
- Planning town on it
(plan to meet the requirements)
- Transfer the town into the site

Where the surveying is needed to do this



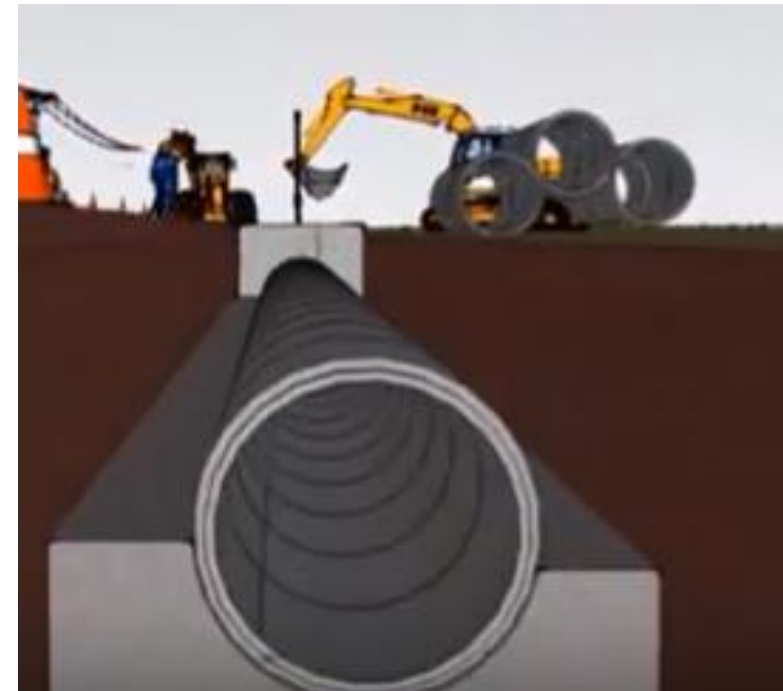
Example 3 Pipelines to carry oil

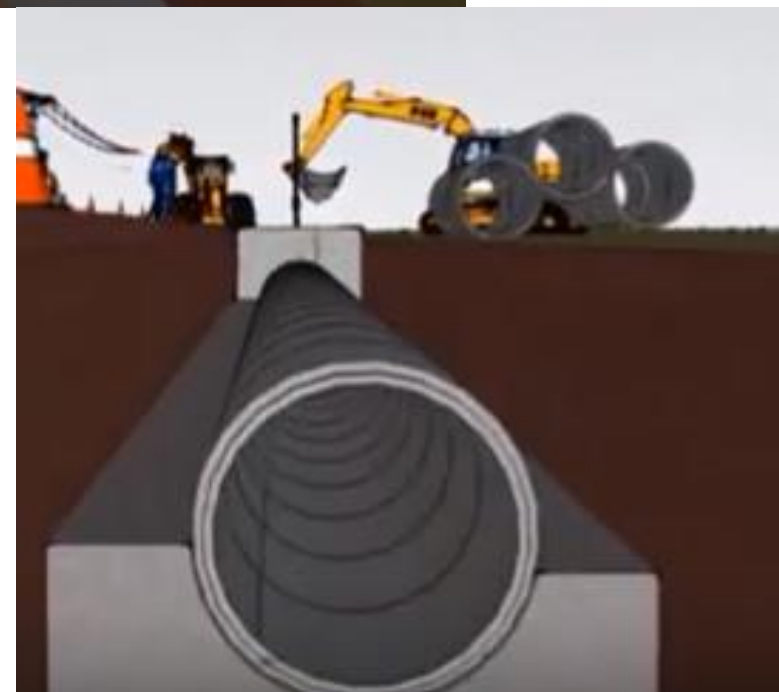
- Construction of pipeline

What is needed to construct a pipeline?

- Site selection
- Knowledge of topography (Map)
- Planning the pipeline on it
(plan to meet the requirements)
- Transfer the pipeline into the site

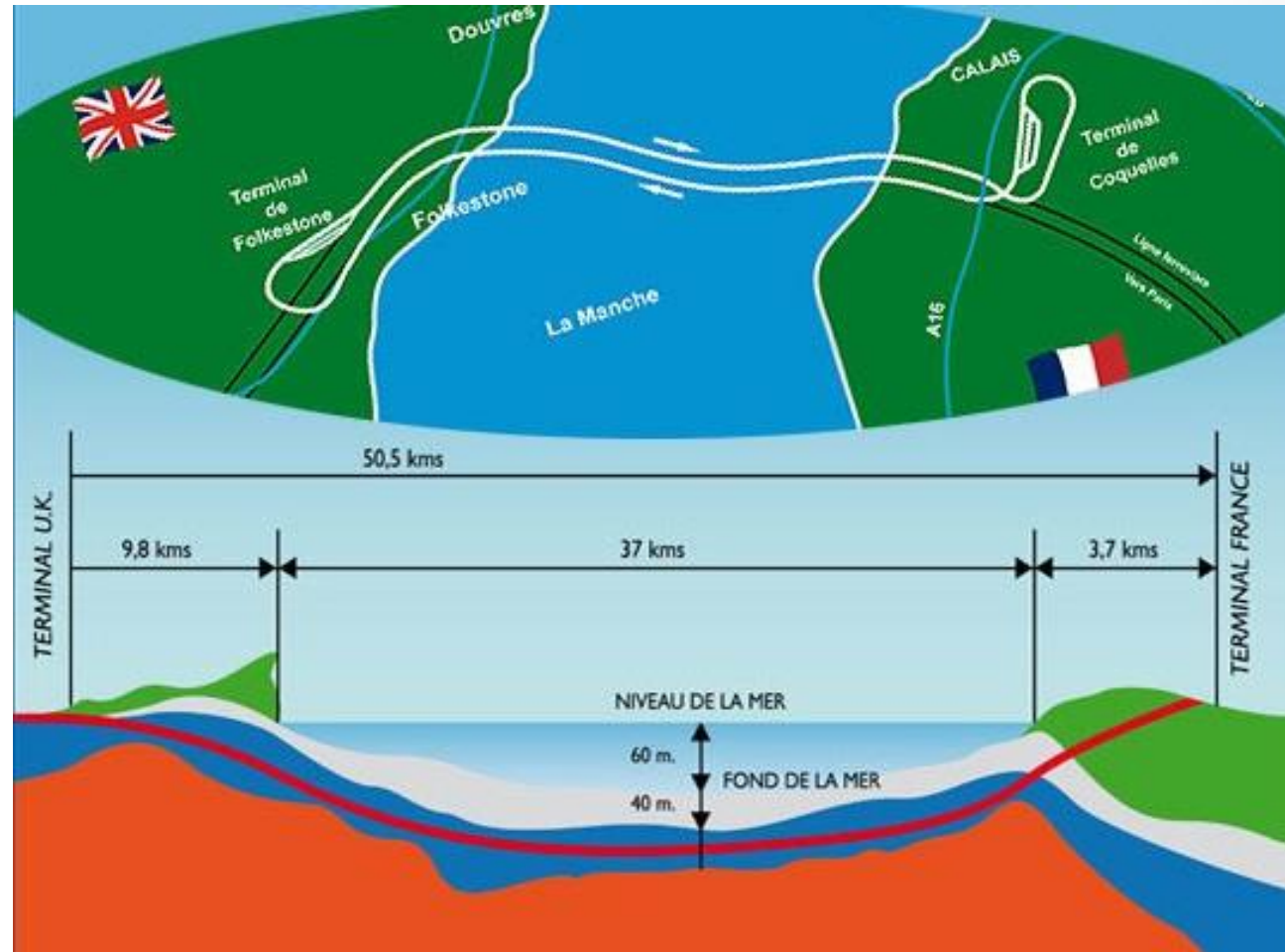
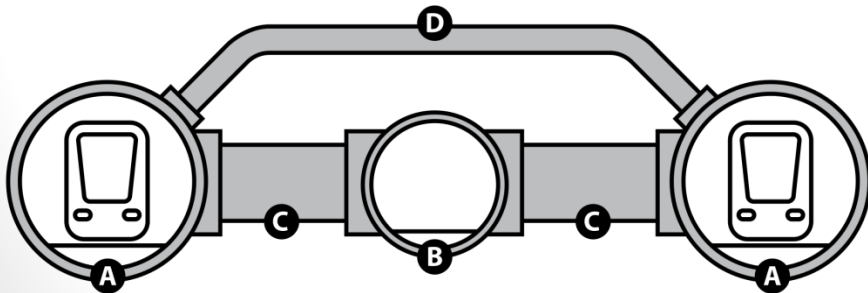
Where the surveying is needed to do this



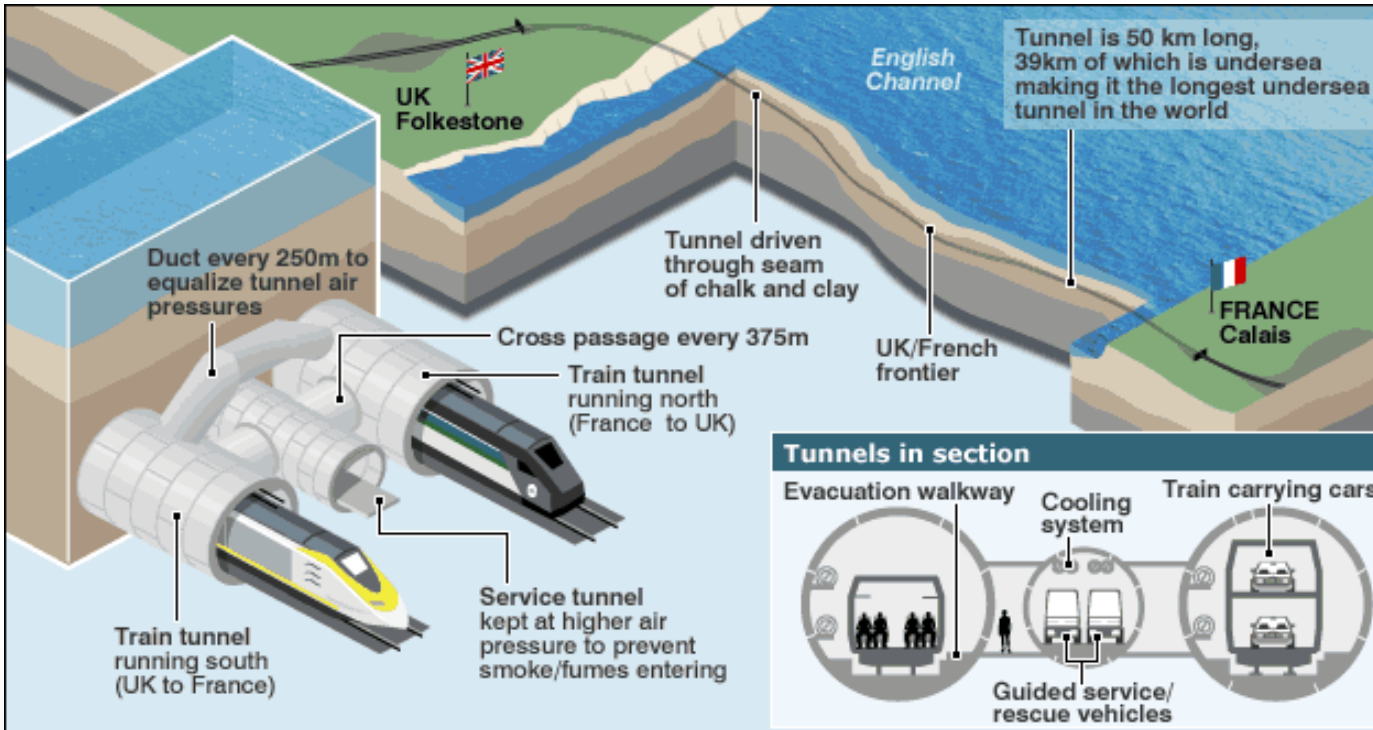


Example 4 The Channel Tunnel

The **Channel Tunnel** is a 50.45-kilometre [rail tunnel](#) linking the United Kingdom, with France



Example 4 The Channel Tunnel



What is surveying ?

- Surveying is the **art** and **science** of **measuring distances, angles, and positions**, **on** or **near** the surface of the earth.

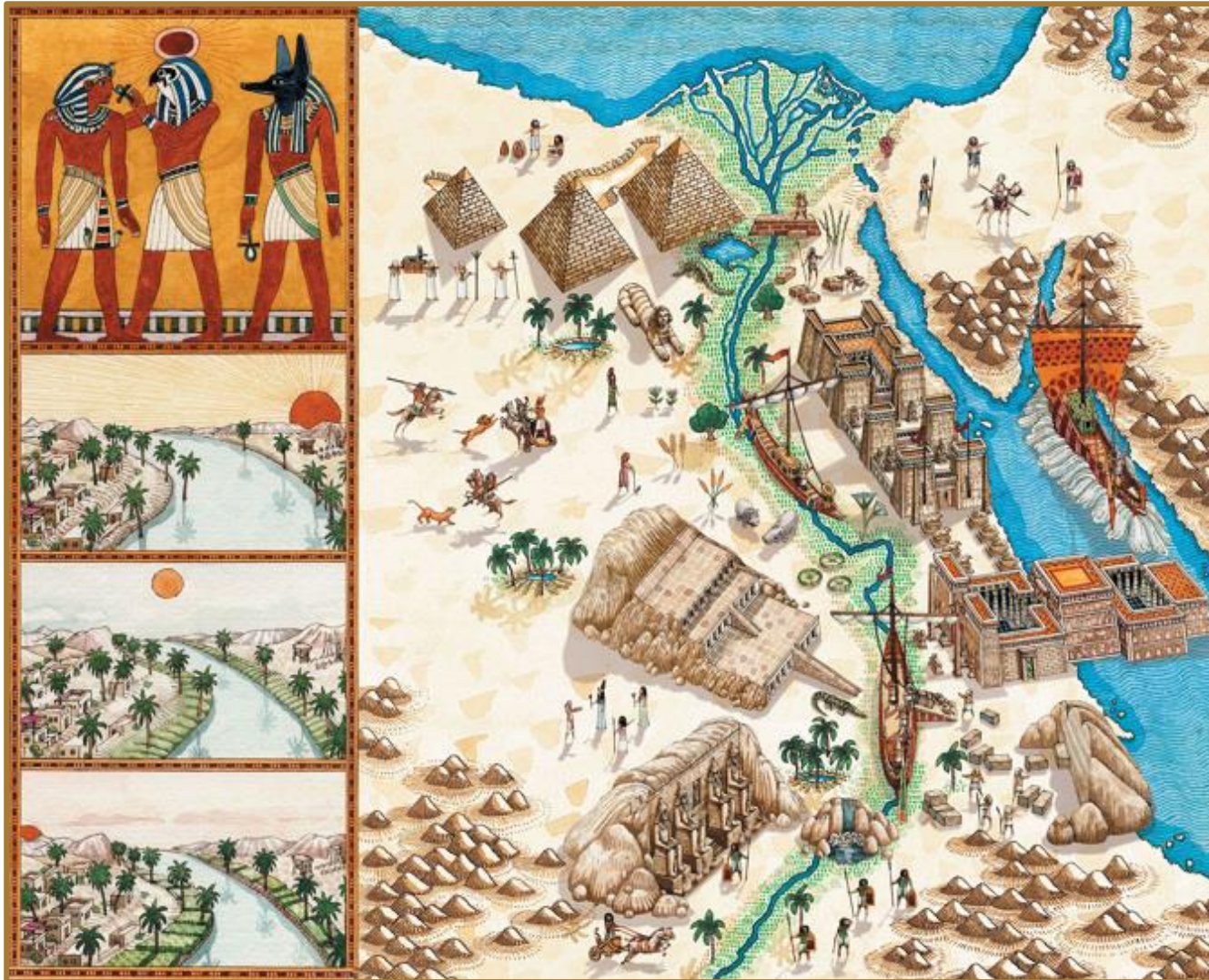
It is an art?

- Because only a surveyor who has full understanding of surveying techniques will be able to determine the most efficient methods required to obtain optimal results over a wide variety of surveying problems.

It is scientific?

Because the use of mathematical techniques to analyze field data. Accuracy and reliability depends on understanding scientific principles underlying and affecting survey measurement.

History of Surveying:

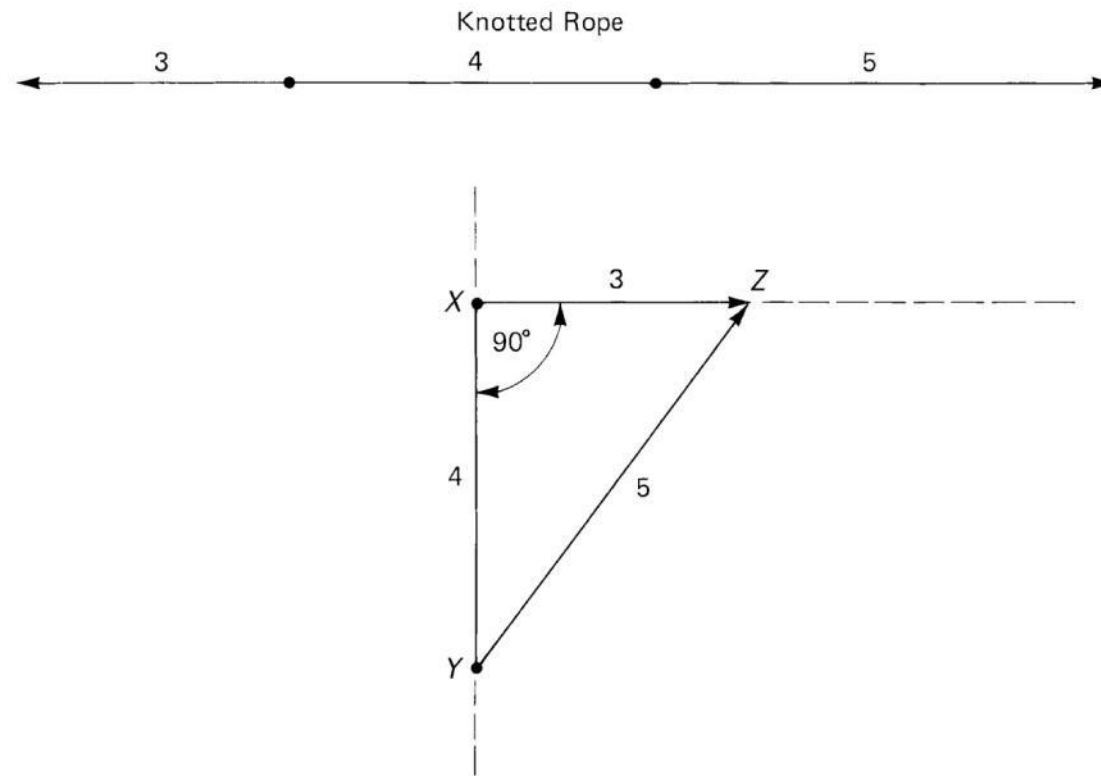


History of Surveying:

- Surveying had its beginning in **Egypt** about 1400 BC
- Land along the Nile River was divided for taxation, divisions were washed away by annual floods.
- “**ROPE-STRETCHERS**” Egyptian surveyors were created to relocate the land divisions (measurements were made with ropes having knots at unit distances).
- Extensive use of surveying in building of **Egyptian monuments**

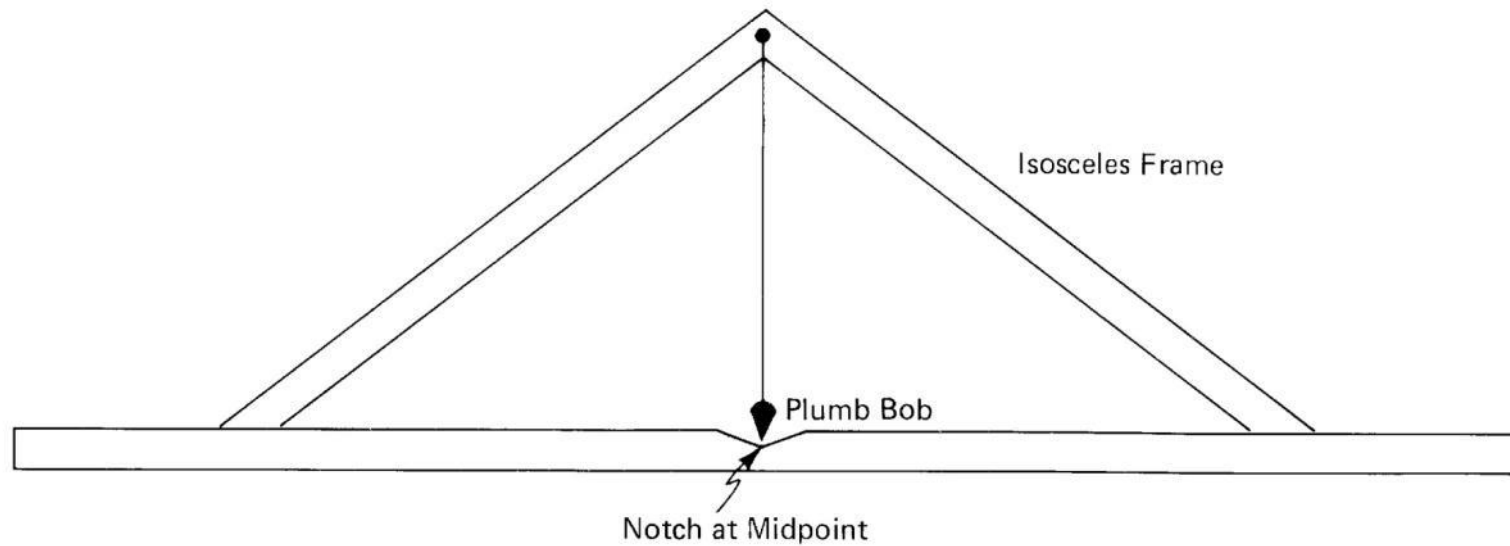
Egyptian surveyors

- Rope knotted at 3:4:5 ratio - used to place point Z at 90 degrees to point X from line XY



Egyptian surveyors

- Early Egyptian level



The End



Any question